

Statement of Dan W. Reicher
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Google
to the Subcommittee on Energy and Environment
United States House of Representatives
Legislative Hearing on the American Clean Energy and Security Act of 2009
April 23, 2009

Chairman Markey, Ranking Member Upton and Members of the Subcommittee, my name is Dan Reicher and I am pleased to share my perspective on the discussion draft of the American Clean Energy and Security Act of 2009 (ACES).

I serve as Director of Climate Change and Energy Initiatives for Google.org, a unit of Google which has been capitalized with more than \$1 billion of Google stock to advance technology, policy and investment in the areas of climate change and energy, global poverty and global health. At Google we have been working to lower the cost and increase the deployment of renewable energy through our Renewable Electricity Cheaper than Coal (RE<C) Initiative and also to accelerate the deployment of plug-in vehicles through our RechargeIT Initiative. We are also developing a smart grid product called PowerMeter which will facilitate near real-time monitoring of home energy use. Additionally, we have been working to increase energy efficiency and use of clean power at Google data centers and offices in the US and other countries.

Recently I served on President Obama's transition team where I helped with the development of the stimulus package for clean energy.

Prior to my position with Google, I was President and Co-Founder of New Energy Capital, a private equity firm funded by Vantage Point Venture Partners and the California State Teachers Retirement System to invest in clean energy projects. New Energy Capital has made equity investments and secured debt financing for ethanol and biodiesel projects, cogeneration facilities, and a biomass power plant. Prior to this position, I was Executive Vice President of Northern Power Systems, one of the nation's oldest renewable energy companies. Northern Power has built almost one thousand energy projects around the world and also developed path-breaking energy technology.

Prior to my roles in the private sector, I served in the Clinton Administration as Assistant Secretary of Energy for Energy Efficiency and Renewable Energy, the Acting Assistant Secretary of Energy for Policy, and Department of Energy Chief of Staff and Deputy Chief of Staff.

I have been asked by the Committee for my views on two aspects of ACES: the proposed national Renewable Energy Standard and the smart grid section of the bill. I also will provide my thoughts on two critical aspects of advancing our clean energy economy: how to improve access to capital for clean energy projects and access to energy information for consumers.

A. National Renewable Energy Standard

Google strongly supports the adoption of a significant national renewable energy standard (RES), following the lead of 28 states that have already set such requirements. Title I of the ACES legislation mandates that 25% of electricity sold by U.S. retail electric suppliers will be supplied by renewable energy and energy efficiency by fiscal year 2025. Qualified renewable energy technologies include geothermal, wind, solar, biomass, marine, hydrokinetic, landfill gas, and qualified hydropower. For every megawatt hour generated from qualified technologies, the retail electric supplier receives one Federal Renewable Energy Credit (REC). Distributed generation sources receive three RECs for every megawatt hour generated. Retail electric suppliers must meet RES percentage requirements starting at 6% in 2012 ramping to 25% by 2025. Federal energy efficiency credits can count for 20% of the mandated quota in any year. The act also mandates the Secretary of Energy establish Federal Renewable Energy and Energy Efficiency Credit Trading Programs.

We believe that the ACES RES provision, implemented well and in conjunction with other policy measures, should be relatively practical and cost-effective to achieve. The Google energy team developed a more aggressive scenario last fall called "Clean Energy 2030," which provides a potential path to generating about two-thirds of US electricity from renewables, while cutting oil use for cars by 44%. The remainder of electricity generation would be provided by nuclear and natural gas generation. Importantly, under the Google scenario, investment in energy-efficient technology would keep electricity demand (including an increase due to plug-in electric vehicles) flat at the current level rather than it growing 33%.

According to our estimates, such a massive build-up of capacity (including additional transmission lines and back-up generation) would cost about \$2 trillion over 22 years, but there are significant savings in avoided fuel costs and new fossil generation capacity. Together, these changes would reduce CO2 emissions by 2,800 million metric tons in 2030, nearly half of today's total energy-related emissions from all sectors. Additional savings would be garnered by improving the efficiency of the personal vehicle fleet. Altogether, the Clean Energy 2030 proposal reduces US CO2 emissions 49% below the baseline projection, while creating nearly 9 million jobs and saving the US economy \$800 billion.

Google believes that the proposed RES is an important tool for accelerating renewable energy technology development, lowering energy costs for consumers, reducing harmful carbon emissions, and improving energy security. Portfolio requirements like the RES provide clear market signals for policy makers, utilities, investors, researchers and entrepreneurs. Existing state requirements have definitely promoted renewables but a national standard - designed and implemented well - could do much more to increase renewables deployment and do so at lower cost by taking a comprehensive and long-term approach.

For the RES to have the maximum desired carbon impact, it must be designed and implemented to reflect the realities of how energy is produced and consumed in the United States. Today, coal fired power represents over 50% of U.S. electrical generation and 84% of greenhouse gas emissions from the entire electric power sector. Nearly 70% of U.S. electrical generation is what is known as "baseload power" -- generated primarily from coal as well as nuclear facilities. Baseload power is the minimum generation that utilities must constantly keep online to meet demand. Baseload technologies need to be highly reliable, be available most of the time (i.e. "high capacity factor"), and low cost.

One of the biggest challenges in moving from our current electricity infrastructure - built largely on baseload fossil-based electricity - to one largely based on renewables, is

managing the increased variability inherent in a system with large-scale reliance on wind and solar power. We believe this transition can be successfully accomplished. First, geothermal and biomass power provide baseload energy output. Hydropower does as well during large periods of the year. Solar energy is not baseload but its output closely follows the daily demand curve in most areas, and with a few hours of thermal storage to provide some dispatch control, concentrating solar can be made to follow the afternoon peak load almost exactly. Wind, while less predictable than other forms of renewable power, can be made less variable by combining outputs from several geographically dispersed locations. Predictive weather modeling can also make it easier to integrate wind into generation planning. And the grid itself can be made more responsive to changing levels of generation capacity through the use of advanced demand management, electricity storage, and other elements of a smart grid infrastructure.

1. Credit Multiplier for Baseload Technologies – Incentivizing Green Baseload Power

Providing a credit incentive in the RES for baseload technologies could directly address the baseload challenge and enhance the carbon reduction impact of the RES. One approach might be to allow qualified baseload technologies to receive additional renewable energy credits. The ACES proposal already includes a credit for distributed generation, with sources such as roof-top solar receiving three RECs for every megawatt-hour generated. To ensure the baseload credit has the desired impact of bringing more megawatts of baseload renewable power online, but does not unduly dilute the RES, it might be capped at a specific level.

A baseload incentive would increase the value of the renewable baseload megawatt-hour for utilities when entering into power purchase agreements with project developers, thereby improving the business case, especially for earlier stage technologies. This credit could also increase the carbon reduction impact of the RES by incentivizing technologies with good capabilities to replace coal-fired power, such as biomass, geothermal, solar thermal with multi-hour storage, and wind with storage. Additionally, the credit could ease adoption of the RES in regions with higher cost baseload renewable options.

If structured properly, an RES can incentivize renewable baseload electricity. For instance, "capacity credits" are already established products which allow generators to directly monetize availability. One alternative could be an REC multiplier built around these capacity credits. Various alternatives should be examined more fully. Whatever the specific approach, we believe that a baseload incentive incorporated into the RES could help further reduce carbon emissions, improve grid operations, drive innovation in a key area, and increase the overall success of the RES. We urge the subcommittee to take a serious look at this proposal and we will work with the subcommittee to develop it further.

2. Energy Efficiency Resource Standard – A Critical Complement to an RES

The Chairman's draft recognizes that there is substantial opportunity to dramatically cut electricity demand and increase the efficiency of the US economy, thus driving down the need to deploy additional generating resources. ACES Title II, Subtitle D provides for an Energy Efficiency Resource Standard (EERS) which sets efficiency resource targets for electricity and gas suppliers over the period 2012-2020. An EERS would be a critical complement to an RES in advancing clean energy deployment rapidly and cost effectively.

Under an EERS, suppliers would be required to obtain energy savings from customer facilities and distributed generation installations in amounts equal to designated percentages for base year energy sales of electricity and natural gas. The requirement is phased in over time and builds on policies now in place in a number of states including

California, Texas, Vermont, Connecticut, Nevada, Hawaii, Pennsylvania, and Colorado designed to cut the growth in electricity demand through energy efficiency. Eligible energy savings measures include efficiency improvements to new or existing customer facilities, distributed energy technologies and combined heat and power systems, and recycled energy from a variety of defined commercial and industrial energy applications.

The EERS is a compelling complement to an RES. An EERS moderates demand growth so that RES targets can actually reduce fossil fuel consumption. In the Google Clean Energy 2030 Plan, energy efficiency deployment reduces projected electricity demand 33%. This is the equivalent to about 175,000 megawatts of coal generation or several hundred plants. *By moderating demand growth through an EERS and accelerating clean generation through an RES, we can slow and begin to decrease carbon emissions in the utility sector, while we work to implement comprehensive controls on climate emissions.* Congress should support this complementary EERS-RES approach as a major down payment on reducing carbon emissions. As a technical matter, we also suggest the subcommittee consider how to harmonize the requirements of the proposed EERS, with provisions of the RES that allow efficiency measures to count for up to 20 percent of the mandate.

3. Improving Support for Advanced Geothermal

There are several attractive renewable energy technologies with the potential for large-scale US deployment. Wind and solar clearly represent significant resources and there is substantial potential in the various applications of biomass. A technology with vast potential – and until recently little support – could be the real sleeping giant.

Enhanced Geothermal Systems (EGS) use hydraulic stimulation, a commonly used technique in oil and gas production, to increase the permeability of hot rock deep below the surface. Water is injected into the rock, where it is circulated and heated to produce steam, then piped to the surface to spin a turbine. With EGS, geothermal reservoirs can be "manufactured" to very large scale, thus breaking geothermal out of the traditional size limitations of naturally occurring geothermal systems. While the resource of naturally existing geothermal reservoirs is relatively limited and concentrated in the Western U.S., the resource of high temperature rock capable of supporting power production with EGS is truly gigantic and can be found nationwide. A 2007 study by the Massachusetts Institute of Technology (MIT) found EGS to be a highly promising technology. The study concluded that just 2% of the heat below the continental U.S. between 3 and 10 kilometers depth (1.8 to 6.2 miles) is equivalent to over 2,500 times total U.S. annual energy use. Estimates of generation potential from EGS in the lower 48 states range from over 500,000 megawatts (U.S. Geological Survey) to over 12,400,000 megawatts (MIT). For perspective, the total installed generating capacity of coal power in the U.S. is around 330,000 megawatts, and around 1,000,000 megawatts for all technologies.

EGS, like conventional geothermal – and coal – provides baseload generation 24 hours a day, year round. This allows EGS to directly replace coal capacity on the grid making it a particularly effective climate technology. EGS is currently in its early phase of commercialization. EGS leadership is centered in Australia and Europe where governments have provided significant research support, developed successful demonstration projects, and have established supportive policies to accelerate commercialization. The US once led in this technology and now has a chance to regain its lead as a result of \$400 million for geothermal technologies, including EGS, in the recent stimulus legislation. Additionally, the Energy Independence and Security Act of 2007 (EISA) authorizes up to \$95 million annually for geothermal technologies though FY09 appropriations for geothermal were set at \$44 million.

Google believes this technology has such promise that we have taken several steps to help advance EGS including making maps of the EGS resource by state available in Google Earth, making over \$10 million in investments in EGS-related companies, helping to advance federal policy work, and raising public awareness of the technology. We're pleased that Energy Secretary Steve Chu, prior to his appointment, helped make the compelling case for EGS in a YouTube video.

For EGS to play a major role in electricity supply, it must be demonstrated at the same or greater scale as conventional commercial geothermal. DOE's current annual appropriations and demonstration project solicitation guidelines are insufficient to support multiple demonstration projects of this scale. Congress should appropriate the amount authorized under EISA and expand that authorization in ACES to aggressively pursue EGS and other advanced geothermal technologies such as co-produced fluids and geo-pressured geothermal.

EGS presents a great opportunity in clean energy - and could be an important climate solution. Now is the moment for the United States to regain its leadership in geothermal technology.

B. Advancing the Smart Grid

Google strongly supports a national commitment to building a smart grid. At Google we are working to advance the smart grid on several fronts:

- Over the last year, our engineers have developed a simple and secure software tool called Google PowerMeter. This free product will give consumers a means to draw data from their utility via a smart meter or from in-home devices to see their own home electricity consumption in near real time, on their computer or cell phone. We expect to launch this product shortly.
- We have developed a fleet of plug-in hybrid-electric vehicles that have provided significant public data on fuel efficiency under driving conditions that simulate common US driving patterns. Lately, we have been working on "smart charging" of plug-in vehicles, with a particular focus on the software that could enable large numbers of cars to be effectively integrated into the electric grid.
- We are also exploring how we might help accelerate the integration of smart appliances and other equipment to cut energy use and reduce peak load.
- And we have launched a partnership with General Electric to advance clean energy policy in Washington with a particular focus on the smart grid.

Overall, we believe we need to develop the smart grid in a way that spurs innovation, drives competition, and supplies maximum information to consumers. We must develop and deploy smart grid technology in a manner that empowers consumers with greater information, tools and choices about how they use electricity, including access to real-time energy information. And energy information should be made available based on open non-proprietary standards to spur the development of products and services to help consumers save energy and money.

The 2007 Energy Independence and Security Act (EISA) took a number of steps to advance the development of a smarter US grid. ACES adds a couple more provisions. We have

reviewed these smart grid provisions and have the following comments:

1. Peak Demand Reduction

Section 143 of ACES requires utilities to publish peak demand reduction goals by specified dates and develop specific plans to meet the goals through various mechanisms including energy efficiency, demand response, smart appliances, smart storage devices, distributed generation, pricing mechanisms and by other means.

This provision could help to further encourage the wide-spread deployment of residential smart meters and accompanying technologies that enable users to monitor and automate power use and thereby improve the ability to cut peak demand. A study conducted by the Department of Energy's Pacific Northwest National Laboratory (PNNL) gave customers access to energy consumption information, broken down by appliance, every fifteen minutes and allowed them to program their water heaters and thermostats to respond to changes in electricity prices. Participants in the PNNL study received cash when they operated their household loads in collaboration with the needs of the grid by reducing their energy usage at times of peak energy demand. Over the year of the study, peak load on the grid was reduced by approximately 15 percent and consumers saved approximately 10 percent on their electricity bills over the previous year. Based on these results, the authors determined that if all customers nationwide engaged in reducing peak loads, peak electricity prices would be substantially reduced and approximately \$70 billion in new generation, transmission, and distribution systems could be avoided, with the savings passed along to ratepayers.

2. Accelerate Smart Appliance Deployment through Energy Star Designation and Efficiency Standards Criteria

Section 142 of ACES would encourage DOE and EPA to provide Energy Star designation for products that incorporate smart grid technologies and capabilities. And ACES section 213 would allow the Secretary of Energy, in setting appliance efficiency standards, to consider smart grid technologies or capabilities incorporated into a covered product that increase energy efficiency. We support both of these provisions. Providing the Energy Star label for smart appliances and equipment would boost consumer interest in these and accelerate utility deployment of smart grid capabilities. And expanding the criteria used to set appliance efficiency standards to include products incorporating smart grid technologies and capabilities would accelerate the deployment of smart air conditioners, dish washers, thermostats, computers, and other appliances and equipment.

C. Improving Access to Energy Information

Mr. Chairman, ACES is a highly complex piece of legislation that will launch scores of new climate and energy-related programs. At the same time, recent stimulus legislation provides unprecedented funding for clean energy. Critical to the successful implementation of both of these programs will be the timely collection, analysis and distribution of energy information for consumers, business and government. We suggest the committee look at two related aspects of this imperative. First, how do we improve consumer access to energy information? Second, how could we improve the role and expand the resources of the Energy Information Administration, particularly with the backing of the new Administration and its focus on improved government transparency and advanced information technology.

1. Improve Consumer Access to Energy Information

With national performance standards for renewable energy and energy efficiency in the form of an RES and EERS, we should ensure that electricity users – large and small - have a more accurate picture of their electricity supply mix. The subcommittee should explore ways to ensure that information on electricity usage, as well as the source and mix of their power, is made readily available to electricity users, so that they may act appropriately.

To access energy information in greater detail, homes must be equipped with smart meters or consumer-installed energy monitoring devices. Smart meters are a key part of the smart grid and will enable utilities to provide better service and a more robust electricity delivery system, in addition to enabling consumer access to information. However, installing smart meters does not automatically mean that consumers will receive better information about their electricity usage. Utilities should be encouraged to ensure great consumer access to energy information in as near real-time as possible.

The recent stimulus legislation provides an opportunity to get started. The \$4.5 billion included for smart grid is an extraordinary opportunity to begin transforming our electricity grid to one that empowers consumers with more information and tools to manage their electricity while creating jobs in the process. The President has indicated that these funds could support the installation of as many as 40 million smart meters. However, draft guidance issued by the Department of Energy on the Smart Grid Investment Grant (SGIG) program discourages, rather than encourages, large scale smart meter deployments. The draft guidance would cap the size of grants at \$20 million, which would dilute the expenditure of the funds. Smart meter deployments on a large scale by an individual utility must be done in the hundreds of thousands or millions and can cost hundreds of millions of dollars. The price caps proposed by DOE should be raised to support large infrastructure investments. DOE should also state how it intends to meet the 40 million smart meter goal set by the White House. Finally, the subcommittee should encourage DOE to use this program to give consumers better information and tools to manage their energy use -- the draft guidance makes no mention of how the program will help consumers realize the benefits of the smart grid.

2. Improve the Role and Expand the Resources of the EIA

The Energy Information Administration could play a much more vital role in providing individual consumers and businesses with critical information that could advance our nation's economic, security and environmental goals. EIA analyses are already relied upon for everything from EPA EnergyStar benchmarking for building efficiency, to Bureau of Labor Statistics reports, to HHS/HUD distribution of low-income assistance. States and private industry are likewise dependent on these surveys for a variety of purposes.

More timely and targeted information is required not just to inform public policy decisions, but to analyze the impact of policy and technology changes on U.S. energy consumption at a level of detail not contemplated by current EIA methodologies. This is especially the case now when changes in domestic energy infrastructure brought about by a combination of market forces and technology-forcing federal initiatives may be at a tipping point.

EIA itself proposed a number of ideas that would improve the quality of its data and bolster its relevance to consumers and States in its January 2009 report to Congress. These include, for example:

- Creation of a state data Application Programming Interface (API), to provide stakeholders' more timely direct access to energy information. This initiative would require database upgrades, and allow EIA to take the first step toward developing a global energy navigator;

- User-generated state energy mapping capability. This initiative would again require additional computing capacity, but would provide for additional geospatial analysis of relevant infrastructure, renewable resource potential and other data of interest; and
- Evaluation of alternative sources of data for end-use estimates. Given the agency's perennial budget constraints, EIA could explore alternative means of data collection, including from commercial sources and via inter-agency collaboration.

This last proposal may have the most immediate potential. In coming months, the Department of Energy will provide billions in stimulus funding to state and local governments for weatherization, efficiency projects, smart grid programs and matching grants, R&D, and other clean energy efforts. These initiatives provide potentially rich sources of data on a range of clean energy projects, if EIA is enlisted to assist in tracking their efficacy. Not only would carving out a significant role for EIA enhance the transparency of stimulus spending in these areas, it might provide the agency valuable experience in tracking efficiency as a resource—a concept that has bedeviled EIA and its development of measurement tools to date.

Likewise, with a national RES and EERS, the Federal government will need to collect data at a previously unprecedented level, in order to ensure compliance. Providing EIA timely access to aggregated data of this nature could provide additional visibility over key renewable energy and efficiency-related developments. And with cap-and-trade legislation, EIA would need to model carbon allowance and offset markets, their interrelation with commodity pricing across the energy complex, and what all of this means to end-use consumers.

Congress, working with the new Administration, should expand EIA's role and increase its funding to advance these and other critical national climate, economic and environmental goals. We stand ready to help in this process.

D. Expanding Federal Support for Clean Energy Finance

The ACES legislation does not directly address a critical issue in advancing our clean energy economy: increasing access to capital for the deployment of literally trillions of dollars worth of clean energy projects that will be essential to meeting our climate and energy security goals, including the requirements of a national RES and EERS and related transmission and smart grid infrastructure.

Last week Senators Bingaman and Murkowski jointly released a discussion draft of the 21st Century Energy Technology Deployment Act (CEDA). And earlier this month Representative Van Hollen introduced the Green Bank Act of 2009. I also want to recognize the important work Representative Inslee has been pursuing on the clean energy finance front. I want to urge the committee to address the critical need for federal investment in clean energy generation, efficiency and transmission projects.

The good news Mr. Chairman is that there is a broad array of clean energy technologies that have been developed with government and private sector investment that could address our many energy-related challenges. The not so good news is that investment in the actual deployment of these technologies – “steel in the ground” as we say in the project investment world – is inadequate. And with the current economic crisis investment has become even more challenging as companies like Lehman Brothers, AIG and Wachovia, which were active in clean energy investment, have left the field.

The federal government should provide financial support to the private sector to help move immature and often higher risk technologies to the market - and from there to commercial scale. The bill that Senate Energy Committee Chairman Bingaman and Ranking Member Murkowski recently released for public comment would be a major step in this regard.

The mission of the Clean Energy Deployment Administration (CEDA) would be to encourage deployment of clean energy technologies that are perceived as too risky by commercial lenders but with high potential to address our environmental, economic and security challenges. The problematic moment of moving a technology from a small pilot project to a full commercial-scale plant is often the point at which many promising energy technologies falter – and a significant number die. In the clean energy technology industry we call it the “Valley of Death”. Bankers are generally reluctant to provide a loan for a project involving a technology that has not been proven at commercial scale. The bankers are critical, however, because a commercial-scale energy project can often cost hundreds of millions or billions of dollars, generally beyond the capacity or interest of venture capital investors who have often advanced the technology through pilot scale.

Mr. Chairman, the Valley of Death looms large. Failing to bridge it has cost us serious progress on many clean energy technologies from wind, solar, and geothermal, to biofuels and efficiency. In some cases investors from other countries have stepped into the breach and the technology has advanced but we have lost the tax and employment benefits of a company based in the U.S. CEDA would use a portfolio investment approach in order to mitigate risk to taxpayers and would work to become self-sustaining over the long term by balancing riskier investments with revenues from other services and less risky investments.

CEDA would provide various types of credit to support deployment of clean energy technologies including loans, loan guarantees and other credit enhancements as well as secondary market support to develop products such as clean energy-backed bonds that would allow less expensive lending in the private sector. CEDA would also assume responsibility for DOE’s current loan guarantee program.

CEDA would be an independent administration within DOE, like the Federal Energy Regulatory Commission. It would be governed by a Board of Directors and an Administrator, all of whom would be appointed with the advice and consent of the Senate. CEDA will also have a permanent Technology Advisory Council to advise on the technical aspects of new technologies and to set goals for the administration.

The Bingaman-Murkowski proposal obviously comes in the midst of an economic crisis. But it is precisely at this moment - when clean energy projects so vital to our economy, environment and security are facing increasing difficulty getting financed - that the mechanism Senator Bingaman and Murkowski propose is so important. This is especially the case for projects involving innovative technologies with higher associated risk – the very technologies that may well hold the keys to addressing the climate crisis, our oil dependence, a deteriorating electric grid and also provide a major stimulus to the faltering economy.

I strongly urge the Committee to take a serious look at how clean energy technologies will navigate the Valley of Death and give strong consideration to the Bingaman-Murkowski proposal - and also analyze the Van Hollen bill - as it develops comprehensive climate and energy legislation. Failure to provide federal support for clean energy finance would jeopardize the development of clean energy projects on a scale and in a time-frame necessary to confront the climate crisis and our energy security challenges.

Finally, feeding all our progress on clean energy deployment must be robust R&D. The federal government has played a prominent role in decades past in launching critical technologies from fossil and nuclear to renewables and efficiency. In recent years federal support for clean energy R&D has waned and with it US leadership in key technologies. The stimulus bill provides an important boost for clean energy but only a modest fraction is oriented toward R&D. If we are to really "crack the code" on clean energy - driving it to a point where it is fully cost competitive and ready for massive deployment - we must make a renewed commitment to significant and sustained federal R&D funding. We stand ready to help with this critical task.